

# **Abstract**

Katarzyna Zych

## **Polish cross-cultural adaptation of the MAI Questionnaire (Metacognitive Awareness Inventory)**

### **Introduction:**

Theorists and researchers agreed that the concept of metacognitive awareness (metacognition), understood as "knowledge about own cognitive processes and the ability to regulate them", is closely related to effective, self-regulated learning.

Metacognitive awareness ensures that students actively participate in the learning process, which increases the efficiency and durability of the acquired knowledge.

The research results indicate that the metacognitive awareness has a positive effect on individual learning process and is a strong predictor of academic success.

The students' metacognitive development can be supported in an educational process, through the use of a special, metacognitive training. The key element to efficient metacognitive training is an assessment of current students' metacognition awareness, using a reliable measuring tool.

Systematic literature review indicates, that Poland, despite the growing needs in this area, still lacks a widely available and psychometrically reliable measuring tool for the quantitative assessment of metacognitive awareness in adolescents and adults, in pedagogical research.

*The Metacognitive Awareness Inventory (MAI)* questionnaire developed and tested by Schraw and Dennison (1994) is the measurement tool that fulfils all criteria mentioned above.

*The MAI* is the research instrument with confirmed psychometric properties, that has been adapted into multiple languages. The tool can be used in the study of metacognitive awareness and its components not only by psychologists, but also by pedagogues.

Because the original version of the *MAI* tool was developed for the English-speaking population, representing a different culture and language area, it is required from the author to carry out the cross-cultural adaptation process, in accordance with the recommendations.

**Objective:**

The main purpose of the thesis was cross-cultural adaptation and development of the Polish version of *MAI (Metacognitive Awareness Inventory)* as well as to measure the level of metacognitive awareness and its components among the Polish population.

**Methods:**

In order to achieve the assumed thesis objectives, four studies were prepared and carried out by the author of the thesis, in accordance with the applicable procedures and principles of the linguistic and psychometric adaptation.

Study 1 (construct equivalence analysis), was carried out with the participation of three independent judges (experts in the field of psychology and pedagogy). The study used a method of diagnostic survey. The research tool was *The Evaluation Sheet No. 1* (developed by the author).

Study 2 (linguistic equivalence assessment), initially included a group of 33 bilingual students of Early English Teaching faculty. After analyzing the correctness of completing the questionnaires, the results from 30 respondents (28 women and 2 men, aged 20-27) were included in the final analysis. The study used a method of diagnostic survey. The research technique was *the MAI PL (Version No. 2 – the pilot)*, obtained in the process of linguistic adaptation.

Study 3 (validation and standardization) was conducted in mid-2017, using quota sample (with respect to gender variable). The study initially included a group of 665 students (including 385 women) from 9 universities, located in different regions of Poland, representing 6 out of 10 education (groups) by ISCED-F classification. After analyzing the correctness of completing the questionnaires, the results from 651 students (382 women and 269 men, aged 18-41) were included in the final analysis. The study used a method of diagnostic survey. The research techniques were: *The MAI PL (Version No. 3)* and *The Rosenberg Self-Esteem Scale (SES)*.

Study 4 (test - retest) was conducted in January 2018, with participation of 129 students of the Faculty of Education at the University of Warsaw, where a one-week gap was used between the first (Study 4A) and second, repeated measurement (Study 4B). After checking the correctness of filling in the questionnaires, the results from N = 83 respondents (83 women), aged 19-44, were included in further statistical analysis. The study used a method of diagnostic survey. The research techniques were: *The MAI PL (Version No. 3)*.

## Results:

The results of Study 1 (construct equivalence analysis), confirmed the equivalence of "metacognitive awareness" construct (measured by *MAI* tool) between the original and Polish culture. It was found that assessments of independent (competent) judges are statistically consistent (Kendall's  $W = 0,513$ ), and the average judges' scores, counted individually for each of 52 statements and collectively for the whole tool, are respectively high.

The results of Study 2, obtained by the bilingual response method, confirmed the linguistic equivalence between the original and Polish version of *the MAI* tool. The Spearman's rank correlation coefficient ( $\rho$ ) indicates a strong positive correlation between two data sets. A high correlation value was found for both the *MAI* total score ( $\rho = 0.878$ ) and the two main components ( $\rho = 0,926$  and  $\rho = 0,781$ ) and for eight *MAI* sub-components ( $\rho = 0,697 - 0,876$ ). All correlation coefficients exceeded the critical value (0,467) for a given sample size ( $N = 30$ ), showing statistical significance at  $p = 0,01$ .

Based on the results of Study 3 (validation and standardization) and Study 4 (test - retest), the psychometric properties of the *MAI PL* tool were evaluated in terms of reliability and validity.

The reliability of *the MAI PL* estimated on the basis of the Cronbach's alpha internal consistency coefficient achieved a high value, both for the entire tool (0,893) and for the two main components (0,788 and 0,851). The obtained coefficients meet the psychometric requirements and are comparable to those obtained for the original version of *MAI* and other language adaptations.

An attempt to estimate *the MAI PL* tool reliability based on the absolute stability coefficient did not give conclusive results. Despite obtaining an acceptable correlation ( $\rho = 0,793$ ,  $p = 0,01$  - for *MAI* total score) between two measurements of Study 4 (test - retest), due to the unfulfilled requirement of the equality of means, it was not possible to apply the absolute stability factor to assess the reliability of *the MAI PL*. These discrepancies in results require further verification studies with the optimization of the time interval between partial surveys.

The validity of *the MAI PL* tool was assessed in several stages, taking into account its two aspects: theoretical validity and criterion validity.

The theoretical validity of the test was estimated on the basis of exploratory (EFA) and confirmatory factor analysis (CFA) and intercorrelation analysis.

The results of the exploratory factor analysis for *MAI PL* confirmed an acceptable and comparable to the original version of *MAI* compliance with the theoretically assumed structure of the *MAI* tool for the 2-factor model. A simultaneous inconsistency with the theoretical 8-factor model was found, revealing for the empirical data the existence of a 5-factor model. A similar deviation from the theoretical model assumptions was obtained by the authors of the original *MAI* version and other researchers.

The Confirmatory Factor Analysis (CFA) conducted to validate the two and eight-factor structure of *MAI PL* as well as comparative analysis with the results of two foreign *MAI* confirmatory analyses showed inconclusive results. On the one hand, significant part of the estimated indicators of goodness-of-fit (chi-square / df, RMSEA, SRMR) reached comparable values with the results obtained for models tested in foreign surveys, whose adjustment was considered acceptable by their authors. On the other hand, the lack of satisfactory values for other important CFA indicators (chi-square, CFI and TLI) suggests that both the two-factor model (with two component) and the eight-factor model (with 8 sub-components) of *the MAI PL* are not in fully matched to empirical data.

The intercorrelation analysis of *the MAI PL* confirmed the existence of a strong positive correlation between the two main components (scales); Knowledge about cognition and Regulation of cognition ( $\rho = 0,628$ ,  $p < 0,01$ ). Comparable values of correlation were obtained by *the MAI tool* authors (in Study No. 1 -  $r = 0.54$ , in Study No. 2 -  $r = 0.45$ , no information on the significance level  $p$ ) and other researchers.

The criterion validity of the *MAI PL* was assessed based on the correlation of the metacognitive awareness (measured by *MAI PL*) with the global self-esteem (measured by SES Self-Assessment Scale). According to theoretical assumptions, it was expected that global self-esteem should positively and significantly statistically correlate with metacognitive awareness, which would confirm the criterion accuracy of *the MAI PL*.

The obtained results confirmed the theoretical assumptions. There was a moderate but statistically significant positive correlation between the total score of *MAI PL* and the *SES* score ( $\rho = 0,214$ ,  $p < 0,01$ ). Comparable direction and strength of the correlation between various components of metacognition and self-esteem, were also confirmed by other researchers.

In the last stage of research work covered by the dissertation, based on the results of Study 3 (validation and normalization), the relationships between students' socio-demographic parameters and the metacognitive awareness level were analyzed .

The grouping variables in the analysis were: gender, age, field of study, year of education, grade average, number of siblings and the birth order of respondents. The assessment was made using a one-dimensional ANOVA variance analysis ( $p < 0.05$ ), for the whole tool, two main components and eight sub-components of *MAI PL*.

The results of the conducted analyses showed that there is a statistically significant differentiation of average results for variables: *gender*, *age* and *grade average*. For other variables: *the field of study*, *the year of education*, *the number of siblings*, *the birth order*, it was found that they do not differentiate the result of the metacognition awareness measurement using *the MAI PL*. The shown relationships were in line with theoretical assumptions.

### **Conclusions:**

The conducted studies indicate that Polish version of Metacognitive Awareness Inventory – *MAI PL* meets the psychometric criteria (reliability and validity) required for research tools.

As a result of *the MAI* cross-cultural adaptation process, a psychometrically tested tool was developed from the area of English-speaking culture to assess the level of metacognitive awareness and its components among the Polish population.

*The MAI PL* is a research tool which can indicate differences in the level of metacognitive awareness and its components in the group of adolescents and adults.

The adaptation of the Polish version of *the MAI* may contribute to the development of methodology for testing metacognitive awareness and its components.